CATHOLIC SECONDARY SCHOOLS ASSOCIATION
2009 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION
GENERAL MATHEMATICS – MARKING GUIDELINES/SOLUTIONS

Section 1
20 marks

Questions 1 –22(1 mark each)

Question	Answer	Content	Syllabus Assessed	Targeted Performance Bands
1	C	M4: Right-angled triangles	P2, P3	3-4
2	A	DA2: Data collection & sampling	P9	2-3
3	A	PB2:Relative frequency & probability	P2, P10	3-4
4	A	FM4: Credit & borrowing	H5, H8	3-4
5	C	FM1: Earning money	P2, P7	3-4
6	D	AM1: Basic algebraic skills	P2	3-4
7	A	DA3: Displaying single data sets	P1, P9, P11	3-4
8	C	DA5: Interpreting sets of data	H1, H2, H4	4-5
9	B	AM4:Modelling linear and non-linear relationships	H3, H5, H11	3-4
10	B	PB3: Multi-stage events	H2, H3, H10	3-4
11	D	AM3:Algebraic skills and techniques	H2, H11	3-4
12	B	M7:Spherical geometry	H1, H2, H7	4-5
13	C	DA6: The Normal Distribution	H2, H4, H9	4-5
14	D	M5: Further applications of area & volume	H1, H6, H7	4-5
15	A	FM3: Taxation	P2, P8	4-5
16	C	M1: Units of measurement	P2, P7	4-5
17	D	DA4: Summary statistics	H1, H2, H4	4-5
18	C	M3: Similarity of two-dimensional figures.	P2, P6	4-5
19	C	PB2:Relative frequency & probability PB3:Multi-stage events	P2, P10 H2, H3, H10	4-5
20	C	FM5: Annuities & loan repayments	H5	4-5
21	B	AM3:Algebraic skills and techniques	H2,H7	4-5
22	A	PB4: Applications of Probability	H2, H4, H11	5-6

Section II

78 marks

Question 23 (13 marks)

(a) (i) (1 mark)

Content: DA4: Summary Statistics.

Outcomes assessed: P2, P7

Targeted Performance Bands: 2-3

Solution	Criteria	Mark
$mean = \dfrac{47+52+57+57}{4} = 53.25kg$	**1 mark** for correct answer.	1

(a) (ii) (2 marks)

Content: DA4: Summary Statistics

Outcomes assessed: P2, P7

Targeted Performance Bands: 2-3

Solution	Criteria	Marks
$51 = \dfrac{(4\times 53.25)+x}{5}$ $x = 255-213$ $= 42kg$	**2 marks** for correct working and correct answer. **1 mark** for significant progress towards correct answer.	2

(b) (i) (2 marks)

Content: M4: Right-angled triangles

Outcomes assessed: P2,P6, P7

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$x^2 = 10^2+8^2$ $x = 12.8$ $= 13m$	**2 marks** for correct working and correct answer. **1 mark** for significant progress towards correct answer.	2

(b) (ii) (1 mark)

Content: M4: Right-angled triangles

Outcomes assessed: P2,P6, P7

Targeted Performance Bands: 3-4

Solution	Criteria	Mark
P=8+16+13=37m	**1 mark** for correct answer.	1

24 + ?

(c) (2 marks)
Content: DA2: Data collection and sampling.
Outcomes assessed: P1, P9, P11
Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$\frac{30}{P} = \frac{9}{72}$ $P = 240$	**2 marks** for correct solution. **1 mark** for significant progress towards correct solution.	2

(d) (2 marks)
Content: M7: Spherical Geometry
Outcomes assessed: H1,H2,H6, H7
Targeted Performance Bands: 4-5

Solution	Criteria	Marks
Time difference = 11+2=13hours Angular distance = 13°x15° = 195°	**2 marks** for correct solution. **1 mark** for significant progress towards correct solution.	2

(e) (i) (1 mark)
Content: AM2: Modelling and linear relationships
Outcomes assessed: P3, P4, P5
Targeted Performance Bands: 2-3

Solution	Criteria	Mark
Cost = $300	**1 mark** for correct solution	1

(e) (ii) (1 mark)
Content: AM2:Modelling and linear relationships
Outcomes assessed: P3, P4, P5
Targeted Performance Bands: 2-3

Solution	Criteria	Mark
Number of invitations = 125	**1 mark** for correct solution	1

(e) (iii) (1 mark)
Content: AM2: Modelling and linear relationships
Outcomes assessed: P3, P4, P5
Targeted Performance Bands: 3-4

Solution	Criteria	Mark
Cost = $150 Number of invitations = 75 Average cost = 150 ÷ 75 = $2	**1 mark** for correct solution	1

Question 24 (13 marks)

(a) (2 marks)

Content: AM3:Algebraic skills and techniques

Outcomes assessed: H2, H3, H11

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$\frac{3t^2}{s} \times \frac{6}{5st}$ $= \frac{18t^2}{5s^2t}$ $= \frac{18t}{5s^2}$	**2 marks** for correct working and correct answer. **1 marks** for significant progress towards answer.	2

(b) (i) (1 mark)

Content: DA5:Interpreting sets of data

Outcomes assessed: H4,H5, H11

Targeted Performance Bands: 2-3

Solution	Criteria	Mark
45	**1 mark** for correct answer.	1

(b) (ii) (1 mark)

Content: DA5:Interpreting sets of data

Outcomes assessed: H4,H5, H11

Targeted Performance Bands: 2-3

Solution	Criteria	Mark
28	**1 mark** for correct answer.	1

(b) (iii) (3 marks)

Content: DA5:Interpreting sets of data

Outcomes assessed: H4,H5, H11

Targeted Performance Bands: 5-6

Solution	Criteria	Marks
Shape: Sydney is positively skewed, Melbourne has a slight negative skew. Location: Sydney is clustered in the 20s (median=28) while Melbourne is clustered around 30s (median=34) Spread: Melbourne has a greater spread (range=27) than Sydney (range=18).	**3 marks** with a mark given to a correct comment on each aspect. **2 marks** for significant correct comments on aspects. **1 mark** for a correct comment.	3

(c) (i) (2 marks)
Content: M4: Right-angled triangles
Outcomes assessed: P2,P6, P7
Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$\cos 50^0 = \frac{15}{x}$ $x = 23.3m$	**2 marks** for correct solution. **1 mark** for significant progress towards correct solution.	2

(c) (ii) (2 marks)
Content: M6:Applications of trigonometry
Outcomes assessed: H6,H7
Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$\frac{CD}{\sin 18^0} = \frac{23.3}{\sin 32^0}$ $CD = 14m$	**2 marks** for correct solution. **1 mark** for significant progress towards correct solution.	2

(d) (2 marks)
Content: FM1:Earning Money
Outcomes assessed: P1, P2, P8
Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$Commission = 400 + (3000 + 0.02 \times 50000)$ $= \$4400$	**2 marks** for correct solution. **1 mark** for significant progress towards correct solution.	2

Question 25 (13 marks)

(a) (i) (1 mark)

Content: FM4:Credit and Borrowing

Outcomes assessed: H2

Targeted Performance Bands: 2-3

Solution	Criteria	Mark
$20.44 \div 365 = 0.056\%$	**1 mark** for correct answer.	1

(a) (ii) (2 marks)

Content: FM4:Credit and Borrowing

Outcomes assessed: H8

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$Interest = 0.00056 \times 2699 \times 23 = \$34.76$ $Total = \$2699 + \$34.76 = \$2733.76$ Renata paid \$2733.76	**2 marks** for correct solution. **1 mark** for significant progress towards correct solution.	2

(b) (i) (1 mark)

Content: DA3:Displaying single data sets

Outcomes assessed: P1, P4

Targeted Performance Bands: 3-4

Solution	Criteria	Mark
8+6+7+2+5=28	**1 mark** for correct answer.	1

(b) (ii) (1 mark)

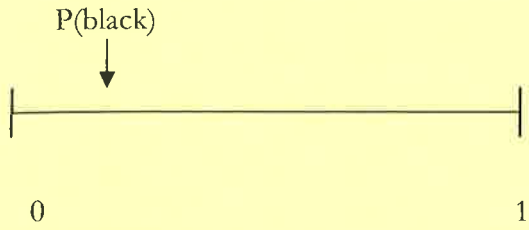
Content: PB2: Relative Frequency and Probability

Outcomes assessed: P2, P10

Targeted Performance Bands: 3-4

Solution	Criteria	Mark
$P(light / darkBrown) = \frac{8+6}{28} = \frac{1}{2}$	**1 mark** for correct answer.	1

(b) (iii) (1 mark)
Content: PB1: The language of chance
Outcomes assessed: P1, P3
Targeted Performance Bands: 3-4

Solution	Criteria	Mark
$P(black) = \frac{5}{28} = 0.18$  	**1 mark** for correct answer.	1

(c) (i) (3 marks)
Content: FM5:Annuities and loan repayments
Outcomes assessed: P2, P7
Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$A = 300\left[\frac{(1.003)^{36} - 1}{0.003}\right]$ $= \$11386.76$ Therefore Julie will not have the required money.	**3 marks** for correct mathematical solution and correct conclusion. **2 marks** for significant progress towards correct solution. **1 mark** for some progress towards solution.	3

(c) (ii) (1 mark)
Content: FM5: Annuities and loan repayments
Outcomes assessed: P2, P7
Targeted Performance Bands: 2-3

Solution	Criteria	Mark
\$12000-\$11386.76=\$613.24	**1 mark** for correct answer.	1

(d) (i) (1 mark)
Content: DA6: The normal distribution
Outcomes assessed: H4, H5, H11
Targeted Performance Bands: 3-4

Solution	Criteria	Mark
$z = \frac{92 - 80}{12} = 1$	**1 mark** for correct answer.	1

(d) (ii) (1 mark)
Content: DA6: The normal distribution
Outcomes assessed: H4,H5, H11
Targeted Performance Bands: 4-5

Solution	Criteria	Mark
Her score is 2 standard deviations above the mean.	**1 mark** for correct answer.	1

(d) (iii) (1 mark)
Content: DA6: The normal distribution
Outcomes assessed: H4,H5, H11
Targeted Performance Bands: 5-6

Solution	Criteria	Mark
Hospitality because the score was 2 SDs above the mean compared to Food Technology which is only 1 SD above the mean.	**1 mark** for correct answer.	1

Question 26 (13 marks)

(a) (i) (1 mark)

Content: PB3: Multi-stage events

Outcomes assessed: H2,H3, H4, H10

Targeted Performance Bands: 4-5

Solution	Criteria	Mark
$26\times26\times26\times10\times10\times10=17,576,000$	**1 mark** for correct answer.	1

(a) (ii) (1 mark)

Content: PB3: Multi-stage events

Outcomes assessed: H2,H3, H4, H10

Targeted Performance Bands: 5-6

Solution	Criteria	Mark
$26\times25\times24\times10\times9\times8=11232000$	**1 mark** for correct answer.	1

(b) (i) (2 marks)

Content: FM5: Annunities and loan repayments

Outcomes assessed: H1,H5

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$n=52\times25=1300$ $r=\frac{0.052}{52}=0.001$ $N=275\left\{\frac{(1+0.001)^{1300}-1}{0.001(1+0.001)^{1300}}\right\}$ $N=200005.0585$ $=\$200005$ Graphics calculator: n=1300 I%=5.2 PV=? PMT=275 FV=0 P/Y=52 C/Y=52	**2 marks** for correct answer. **1 mark** for using correct formula.	2

(b) (ii) (1 mark)
Content: FM5: Annunities and loan repayments
Outcomes assessed: H1,H5
Targeted Performance Bands: 4-5

Solution	Criteria	Mark
The length of the loan would reduce. Graphics calculator: n=? I%=5.2 PV=20000 PMT=300 FV=0 P/Y=52 C/Y=52 n=511 511 payments is approx. 9.8 years. Therefore it would take approx. 10 years to pay off the loan. This would save them 15 years of repayments.	**1 mark** for some valid comment regarding reducing the length of the loan. ***The mathematical calculations are not required for the mark.***	1

(c) (i) (2 marks)
Content: DA5: Interpreting sets of data
Outcomes assessed: H2, H4
Targeted Performance Bands: 3-4

Solution	Criteria	Marks
29 A=~~23~~, B=275	**1 mark** for each correct answer.	2

(c) (ii) (1 mark)
Content: *PB4: Applications of probability*
Outcomes assessed:*H2, H4.*
Targeted Performance Bands:*3-4.*

Solution	Criteria	Marks
$\frac{676}{780} = \frac{13}{15}$	**1 mark** for each correct answer.	1

(c) (iii) (1 mark)
Content: *PB4: Applications of probability*
Outcomes assessed:*H2, H4.*
Targeted Performance Bands:*3-4.*

Solution	Criteria	Mark
$\frac{75}{350} = \frac{3}{14}$	**1 mark** for correct answer.	1

(d) (i) (2 marks)

Content: M5: Further applications of area and volume

Outcomes assessed: H1, H2, H6, H7

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$V = \pi \times 18^2 \times 7$ $= 7125.13213..$ $= 7125m^3$	**2 marks** for correct working and correct answer. **1 mark** for significant progress towards correct solution.	2

(d) (ii) (2 marks)

Content: M5: Further applications of area and volume

Outcomes assessed: H1, H2, H6, H7

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$2545kl = 2545m^3$ $2545 = \pi \times 18^2 \times h$ $h = \dfrac{2545}{\pi \times 18^2}$ $= 2.5m$	**2 marks** for correct solution. **1 mark** for significant progress towards correct solution.	2

Question 27 (13 marks)

(a) (2 marks)

Content: M1: Units of Measurement

Outcomes assessed: P2, P5, P7

Targeted Performance Bands: 4-5

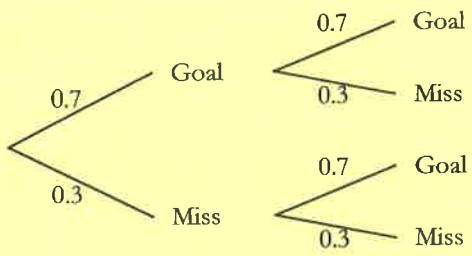
Solution	Criteria	Marks
Original Selling Price $= 800 \times 1.3$ $= \$1040$ Sale Price $= 1040 \times 0.7$ $= \$728$	**2 marks** for correct solution. **1 mark** for significant progress towards correct solution.	2

(b) (i) (1 mark)

Content: PB3: Multi-stage events

Outcomes assessed: H2, H3, H4, H10

Targeted Performance Bands: 4-5

Solution	Criteria	Mark
	**1 mark** for correct tree and probabilities on branches.	1

(b) (ii) (1 mark)

Content: PB3: Multi-stage events

Outcomes assessed: H2, H3, H4, H10

Targeted Performance Bands: 4-5

Solution	Criteria	Mark
$0.3 \times 0.3 = 0.09$	**1 mark** for correct answer.	1

(b) (iii) (2 marks)

Content: PB3: Multi-stage events

Outcomes assessed: H2, H3, H4, H10.

Targeted Performance Bands 4-5

Solution	Criteria	Marks
$(0.7 \times 0.3) + (0.3 \times 0.7)$ $= 0.42$	**2 marks** for correct solution. **1 mark** for progress towards correct answer.	2

(c) (2 marks)

Content: M6: Applications of trigonometry

Outcomes assessed: H1, H6, H7

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$AB^2 = 55^2 + 47^2 - 2 \times 55 \times 47 \times \cos 80^0$ $AB = \sqrt{4336.238921..}$ $= 65.850124...$ $= 66M$	**2 marks** for correct solution. **1 mark** for significant progress towards correct solution.	2

(d) (i) (2 marks)

Content: AM4: Modelling linear and non-linear relationships

Outcomes assessed: H2,H3

Targeted Performance Bands: 4-5

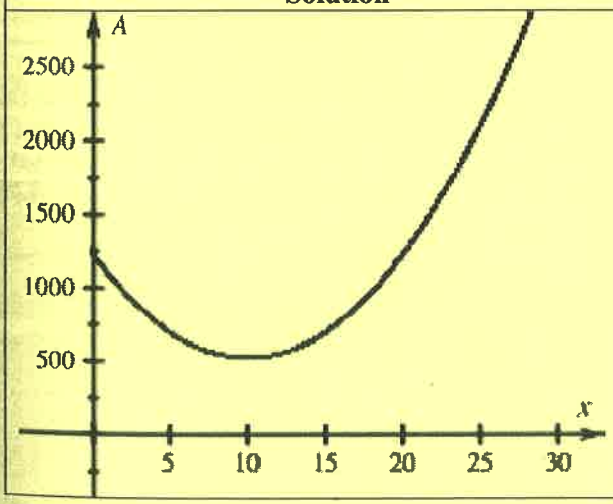
Solution	Criteria	Marks
Perimeter of rectangle $= 3x + x + 3x + x$ $= 8x$ $\therefore$ Perimeter of square $= 140 - 8x$ Length of square $= \frac{140 - 8x}{4}$ $= 35 - 2x$	**2 marks** for correct solution **1 mark** for correct perimeter of square **1 mark** for division of incorrect perimeter of square by 4	2

(d) (ii) (2 marks)

Content: AM4 : Modelling linear and non-linear relationships

Outcomes assessed: H2,H3,H5 H11.

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
	**2 marks** for correct graph. **1 mark** for reasonable graph (appropriate scales, y-intercept $\approx$ 1225, concave up)	2

(d) (iii) (1 mark)

Content: AM4: Modelling linear and non-linear relationships

Outcomes assessed: H2, H3, H5 H11

Targeted Performance Bands: 4-5

Solution	Criteria	Mark
From Graph: Minimum area occurs when $x = 10$. Minimum area $= 1225 - 140(10) + 7(10)^2$ $= 525\ m^2$ OR For minimum area, $x = -\frac{b}{2a}$ $= -\frac{-140}{2 \times 7}$ $= 10$ Minimum area $= 1225 - 140(10) + 7(10)^2$ $= 525\ m^2$	**1 mark** for correct answer.	1

Question 28 (13 marks)

(a) (3 marks)

Content: FM6- Depreciation

Outcomes assessed: H2,H5

Targeted Performance Bands: 5-6

Solution	Criteria	Marks
$S = V_o(1-r)^n$ $0.25 = 1(1-r)^5$ $\sqrt[5]{0.25} = 1-r$ $r = 1-\sqrt[5]{0.25}$ $= 0.242$ 24.2%	**3 marks** for correct working and correct answer. **2 marks** for significant progress towards correct solution. **1 mark** for some progress towards answer.	3

(b) (i) (1 mark)

Content: DA7: Correlation

Outcomes assessed: H1, H2, H4, H5, H9, H11

Targeted Performance Bands: 3-4

Solution	Criteria	Mark
174cm	**1 mark** for correct answer.	1

173-174

(b) (ii) (2 marks)

Content: DA7: Correlation

Outcomes assessed: H1, H2, H4, H5, H9, H11

Targeted Performance Bands: 5-6

Solution	Criteria	Marks
While two things may have a statistical correlation it does not necessarily mean that one causes the other. In this case they are not causal because some people can be short and heavy (e.g. student 70kg, 155cm) while others can be tall and light (e.g. student 57kg, 174cm)	**2 marks** for mentioning causality concept and examples from graph. **1mark** for stating causality or examples from graph.	2

(c) (2 marks)

Content: FM2: Investing money

Outcomes assessed: P2, P8

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$I = \Pr n$ $315 = P \times 0.075 \times 1.5$ $P = \$2800$	**2 marks** for correct working and answer. **1 mark** for progress towards correct answer.	2

(d) (i) (1 mark)
Content: PB2: Relative Frequency and Probability
Outcomes assessed: P2, P10, P11
Targeted Performance Bands: 3-4

Solution	Criteria	Mark
If Bill throws a 1, he must pass his die to Julie (to his left) and the game is over. The probability of this is $\frac{1}{6}$. If Bill throws a 6, he must pass his die to Julie (to his right). The probability of this is $\frac{1}{6}$. In all other cases the game continues. So the probability of Bill winning is $\frac{1}{6} + \frac{1}{6} = \frac{1}{3}$.	**1 mark** for correct explanation	1

(d) (ii) (1 mark)
Content: AM1: Basic algebraic skills
Outcomes assessed: P2, P3, P7
Targeted Performance Bands: 2-3

Solution	Criteria	Mark
P(game ending after 2 turns) $= 1-\left(\frac{2}{3}\right)^2$ $= \frac{5}{9}$	**1 mark** for correct answer	1

(d) (iii) (3 marks)
Content: AM3: Algebraic skills and techniques
Outcomes assessed: H2, H3, H7
Targeted Performance Bands: 5-6

Solution	Criteria	Marks
P(game ending after n turns) $= 0.99$ $1-\left(\frac{2}{3}\right)^n = 0.99$ $\left(\frac{2}{3}\right)^n = 0.01$ Guess & check: $n = 10, \left(\frac{2}{3}\right)^{10} = 0.0173$ $n = 11, \left(\frac{2}{3}\right)^{11} = 0.1156$ $n = 12, \left(\frac{2}{3}\right)^{12} = 0.008$ $\therefore$ The game will need 12 turns to be at least 99% of finishing.	**3 marks** for correct answer including conclusion **2 marks** for correct solution to equation but incorrect or missing conclusion **1 mark** for using 0.99 (or equivalent) in formula	3